CIVIL ENGINEERING
SOLUTIONS

LEVEL 1 DOWNSTREAM ANALYSIS

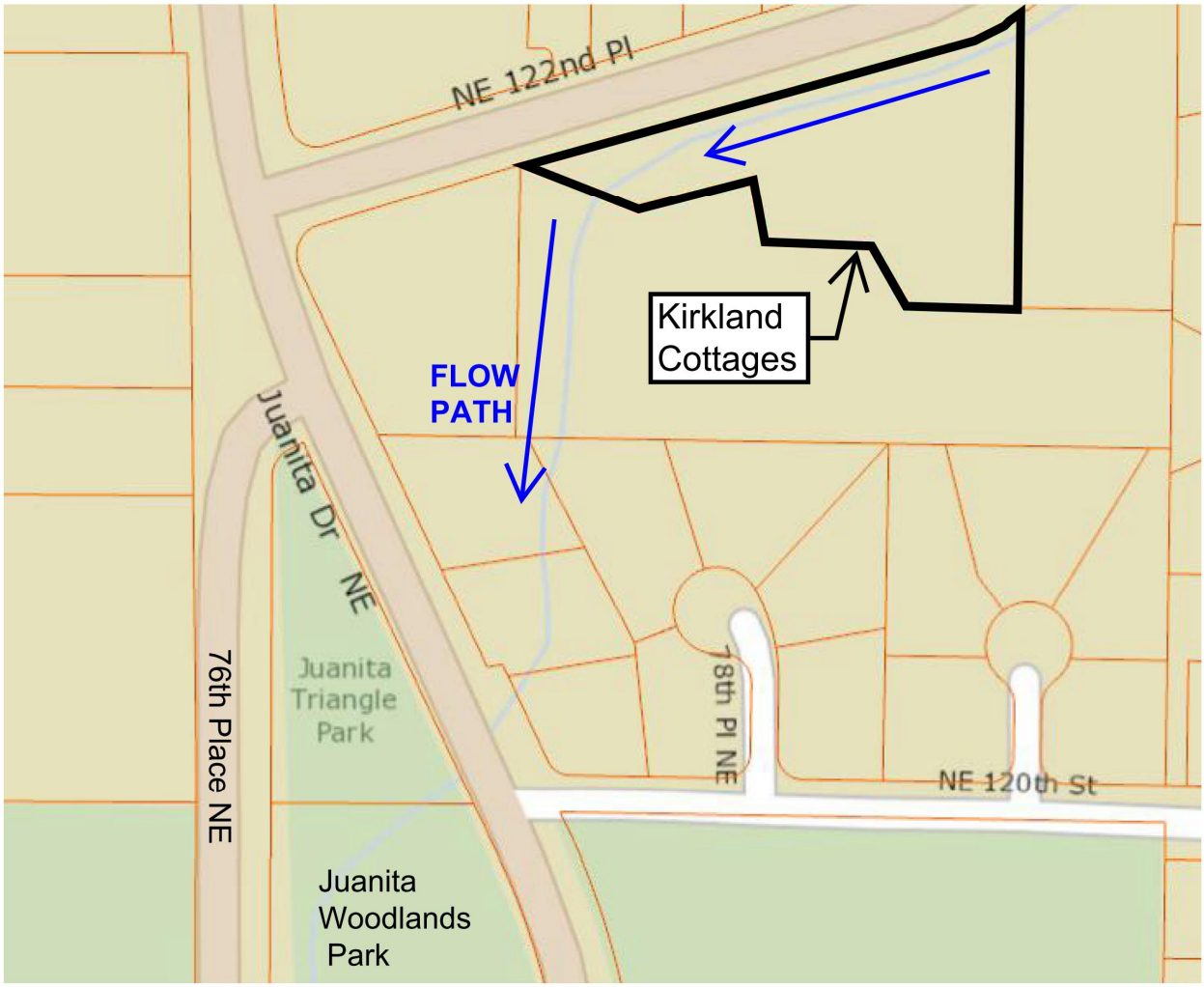
Champagne Creek (Class B Stream)

Kirkland Cottages
7845 NE 122nd Place
Kirkland, WA 98034

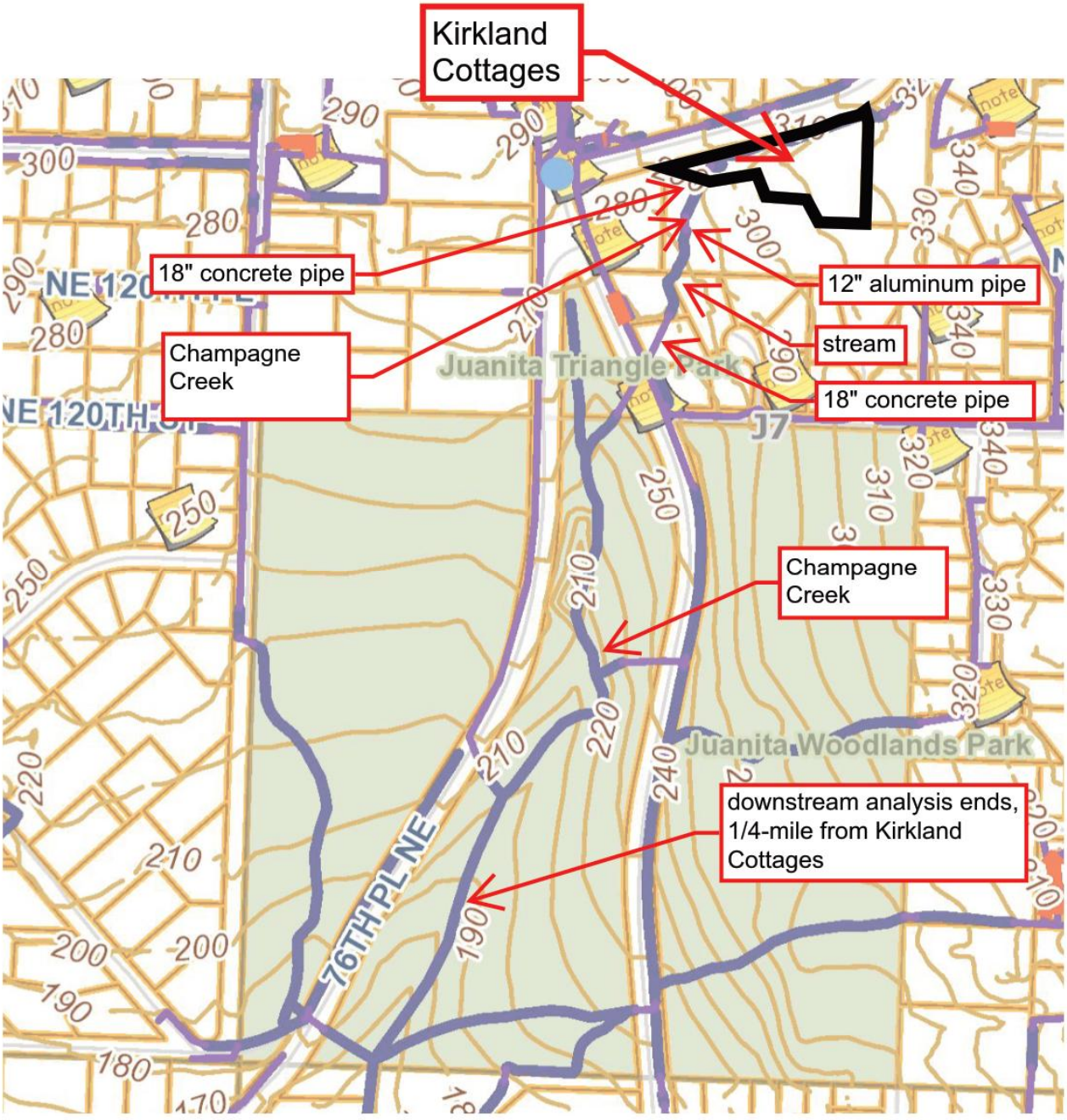
Tax Map #607650-0421
February 25, 2016
CES #1430

Site Visit by Stephenie Seawall, Civil Engineer
Reviewed and Edited by Duffy Ellis, PE

Digitally signed by Persona Not Validated - 1445900946720
DN: cn=Persona Not Validated - 1445900946720, ou=Symantec Trust Network, email=duffy@cesolutions.us
Reason: I am the author of this document
Location: 908 NW 51st ST, SEATTLE, WA
Date: 2016.02.25 13:58:43 -08'00'

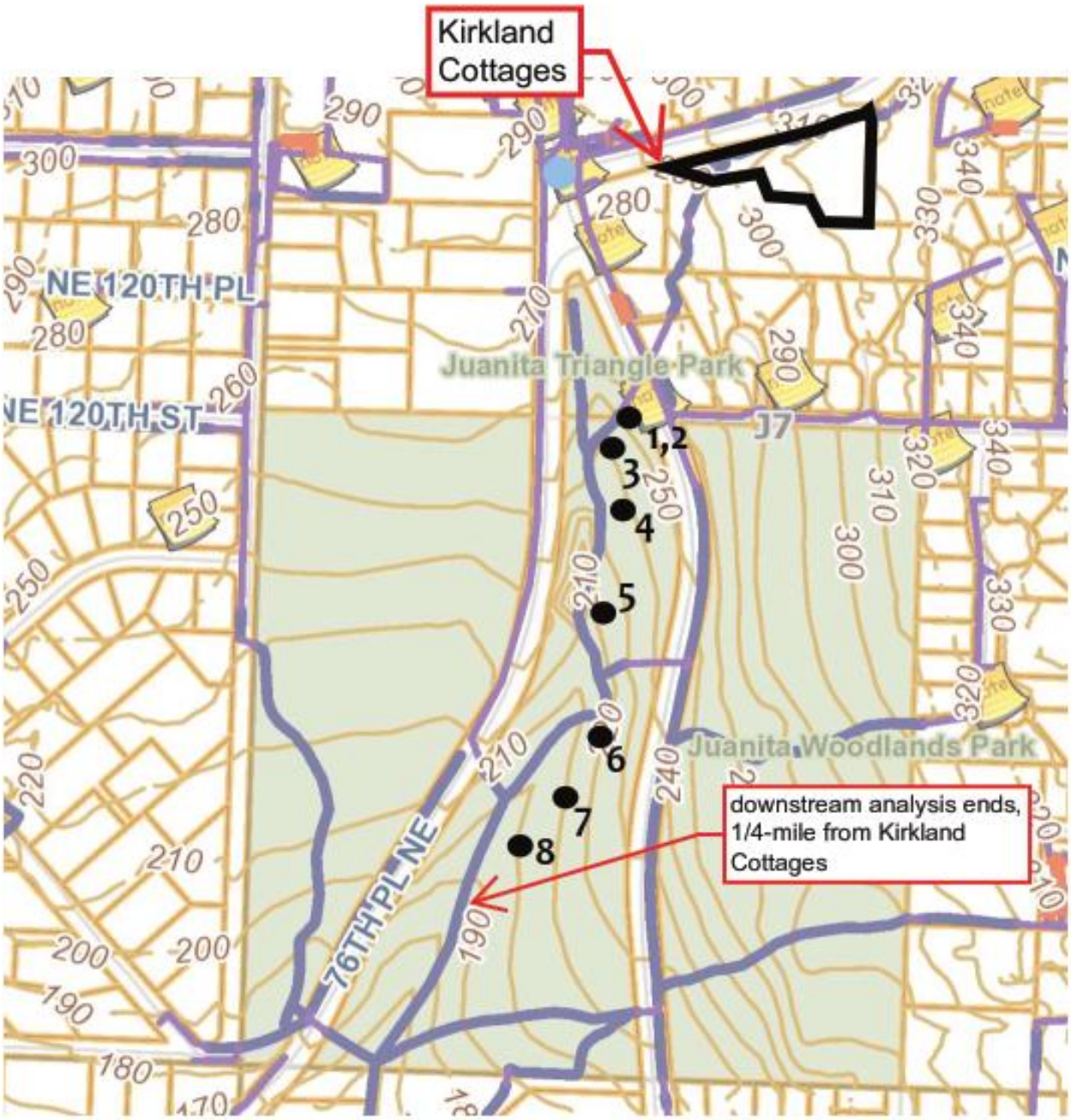


Downstream Analysis Map



Downstream Analysis Map 2

Numbers refer to the picture numbers in the report



TIR SECTION 3
OFFSITE ANALYSIS

Executive Summary
The undersigned's civil engineer visited site and performed a downstream analysis of Champagne Creek within a ¼ mile of subject site on October 13, 2015. Champagne Creek is a Class B Stream as evaluated and noted in stream reports by the The Watershed Group and Bill Granger, a wetland biologist on behalf of the applicant. See the 8 ½ x 11 downstream analysis maps on previous sheets for the downstream stream path that was observed.

Champagne Creek for ¼ mile below is primarily an open channel stream with a mix of piped culverts at all street crossings as it heads south towards it's discharge at Lake Washington. We estimate the tributary basin to this section of Champagne Creek at roughly 75 acres. See our TIR report for some basic hydrologic and hydraulic claculations prepared due to fact subject development is proposing new culvert over the creek and removing an existing culvert and restoring creek to natural channel flow.

In general, the inspected creek path appears in good condition without notice of any significant signs of erosion issues or otherwise. Our opinion is subject development of this project will not adversely affect Champagne Creek downstream of this site. Relevant to this statement is the fact this project will be required to install a level 2 storm detention vault that will mitigate peak and duration of storm flows discharging into Champagne creek west of the new driveway crossing.

Flowpath
Champagne Creek flows as open creek for the entirety of the Juanita Woodlands Park to the south. Downstream analysis was started alongside of Juanita Drive, not at the actual property due to inaccessibility to private property and heavy vegetation constraints. The average drainage gradient for subject path is approximately **6%** for the stream section northeast of Juanita Drive, and a steeper gradient of **20%** after it crosses Juanita Drive. One can therefore assume that pipe flow capacity is relatively good given this average pipe slope and pipe sizes from the map. It's our opinion that pipe capacity analysis is not warranted at this time.

It's relevant to mention that a formal research into drainage complaints, drainage related problems, or capacity issues downstream was not performed. We will rely on City Review of this report to indicate otherwise.

Downstream Analysis
Task 1. Study area Definition and Maps

See map on Sheet 2 of this report, sourced from the City of Kirkland Mapping Portal.

Task 2. Resource Review

The City Kirkland GIS Portal website was primarily utilized to review for any sensitive areas and for basic drainage information for subject site. It is the opinion of CES that a review of items such as floodplain maps, other drainage studies, wetlands maps, etc. are deemed not relevant in this particular situation given this site is simply discharging into an existing storm system. What is most important is identifying any downstream drainage problems that might be exacerbated by this project.

Task 3. Field Inspection

Offsite-Upstream drainage Inspection

Not warranted for site.

Onsite Drainage Inspection

Not warranted for site. Stormwater will enter the system (stream) directly in front of the new houses, see future sheet C2.0 in the civil planset.

Offsite--Downstream Drainage Inspection

See our map on Page 2 of this report. Downstream storm system was inaccessible, due to private property and excess vegetation, therefore analysis began at Juanita Drive and continued southwest, from the outlet of the 18" concrete pipe continuing along the stream to the southern end of the park.

See photos on the following pages for reference.

Picture 1: 18" concrete pipe outlet in Juanita Triangle Park going under Juanita Drive NE.

Picture 2: Same discharge, water discharging out of 18" culvert pipe

Picture 3: Stream bed thru Juanita Woodlands Park.

Picture 4: Stream bed thru Juanita Woodlands Park.

Picture 5: Stream thru Juanita Woodlands Park.

Picture 6: Stream bed thru Juanita Woodlands Park.

Picture 7: Looking across the creek with street in background, fairly heavily vegetated and no significant signs of erosion.

Picture 8: Further downstream picture of creek in Juanita Woodlands Park.